Plots, Calculations and Graphics Tools (PCG2)

Software Transfer Request Presentation

Presented by

PCG2 Software Development

November 8, 2010

Why An Advisory System

- Through time, the need to provide tools that quickly and efficiently facilitate data analysis continues to be a constant, and many times growing demand.

- Engineers must perform data analysis to: confirm system performance, requirement conformance, understand behavior, perform feasibility studies, trends, trouble-shooting and comparisons, potentially across vehicles and missions.

- Data analysis needs may be near real-time, post-test or historical. They may support activities in the Firing Room or in the office area and the users continue to express needs for flexible and agile capabilities.

- Objective Evidence of positions in the form of analyzed data are readily used in program decision-making throughout the centers on a daily basis.

- Manual analysis and interpretation of data like that performed by the Shuttle Program 25+ years ago can be a huge impact on the Engineering workforce and they constantly request methods to help and assist in performing this obligation.

The PCG2 Tool Meets These Needs and More

PCG2 Advisory System

- This easy to use tool provides a single user interface to view data in a pictorial, tabular or graphical format. It allows the user to view the same display and data in the Control Room, engineering office area, or remote sites.

- It supports user defined parameter sets that may be frequently used saving time during operations (For example: predefinition of FDs to be plotted together or predefinition of limit sets).

- Displays can be quickly created and deployed. They are built and tested by the USER without Board control, in an engineering tool box fashion. They may contain animation, embedded calculations and alarms.

  - Embedded Calculations - equations are specified with an easy-to-use syntax for deriving new measurements from calculations on multiple input data.

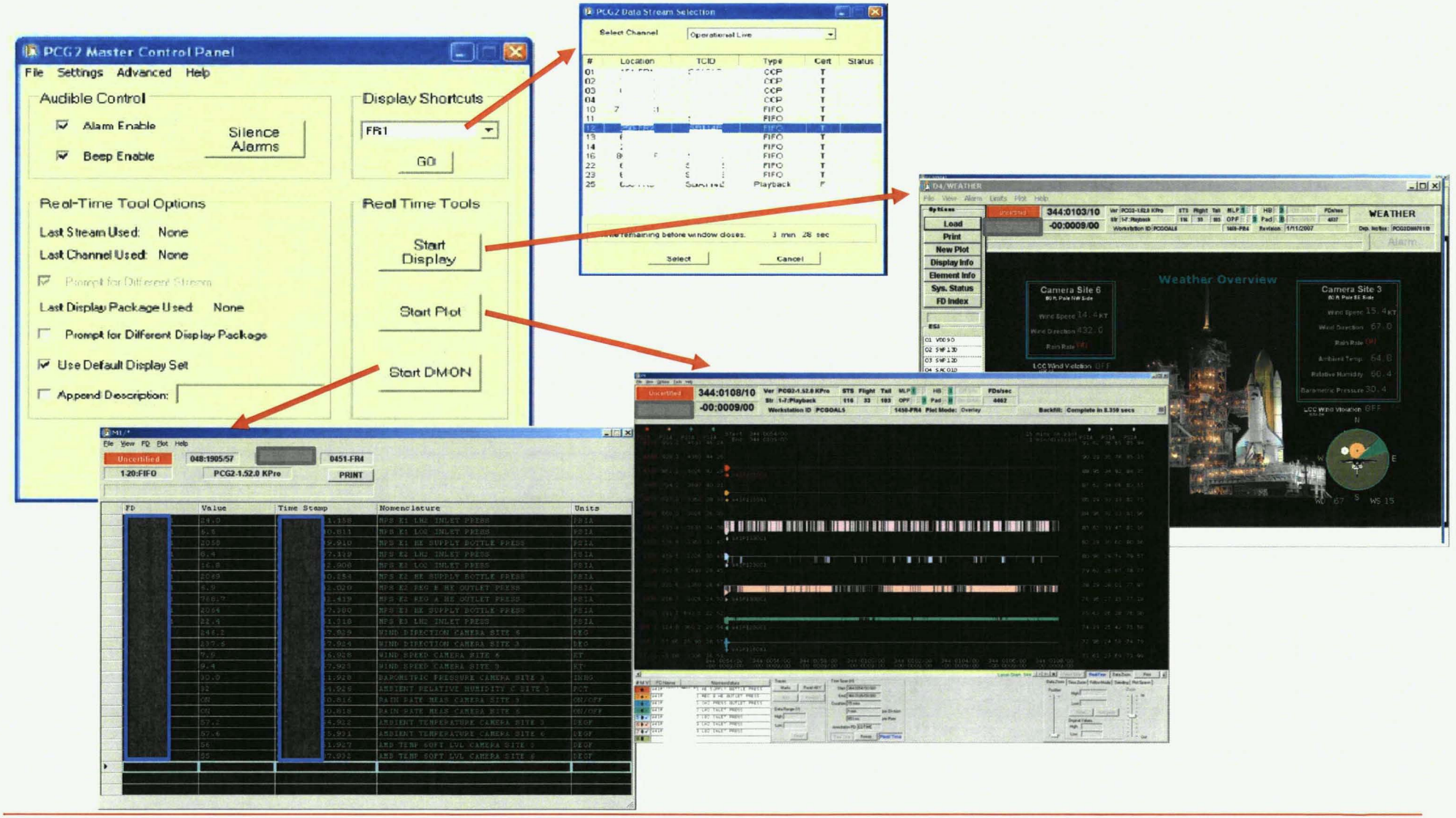
  - Graphical Animations - animations using either contiguous or non-contiguous character positions as well as animations using graphical images driven by data ranges.

PCG2 Advisory System

- Plotting software provides many capabilities such as trending, data vs. data, zooming, historical overlay and event triggers.
- Fusion and Health information is included in the data stream for display, plotting, recording and retrieval.
- Users can initiate monitoring using a pictorial view (Real Time Display) then view a data element on a graphical plot. Calculations and detailed monitoring or information/data for a specific data item may be easily added.
- PCG2 includes a configuration management deployment tool which updates client workstations automatically with the version dictated by the processing requirements (done automatically at startup).
- Data Stream contains a compact representation of the data and is distributed via IP Multicast
- Security infrastructure has been defined. FTS Server and proxy allows secure transfer of information from the controlled environment to the uncontrolled environment.

Specific Features

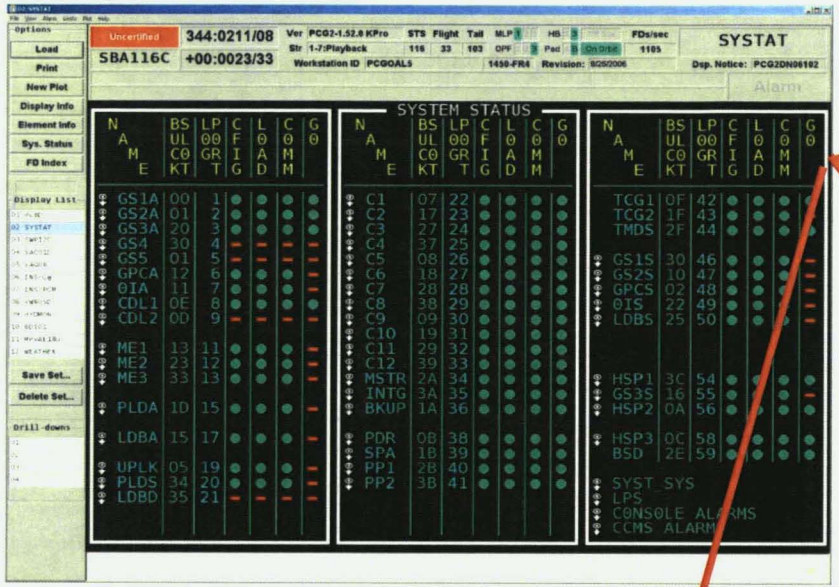
A single GUI allows users to select data streams and Display Tools desired to monitor data



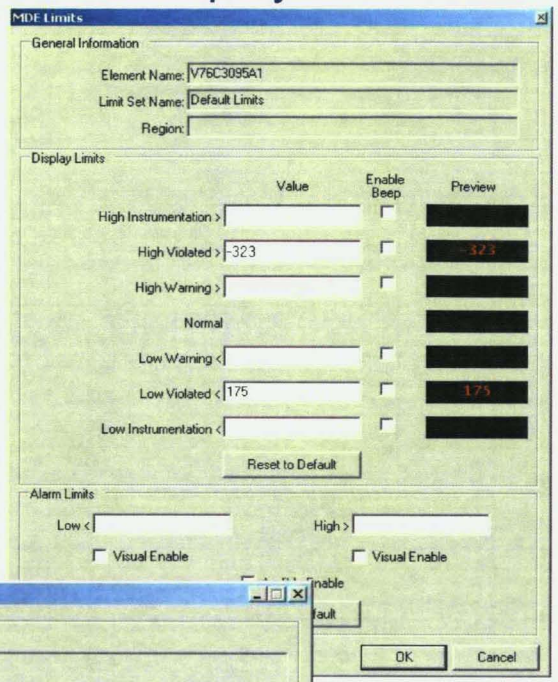
United Space Alliance

Specific Features

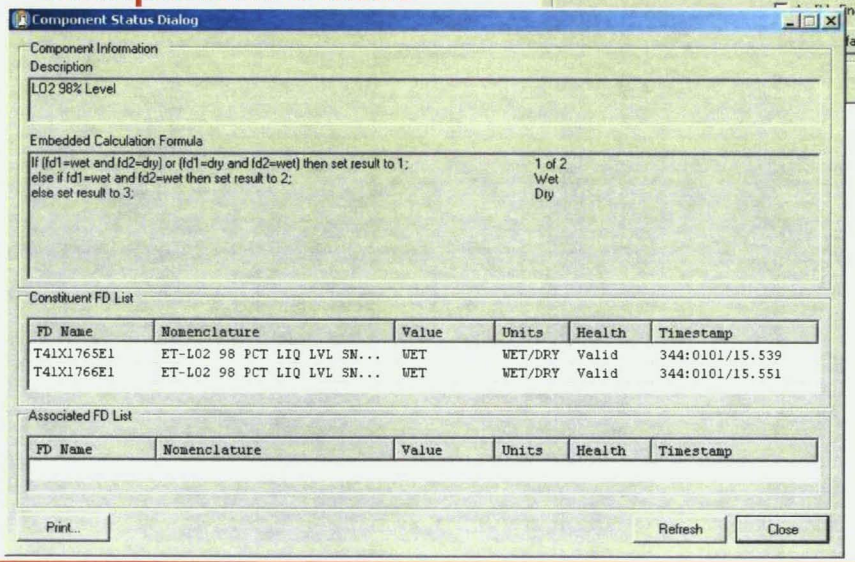
Additional detailed information is available for specific data items on a display



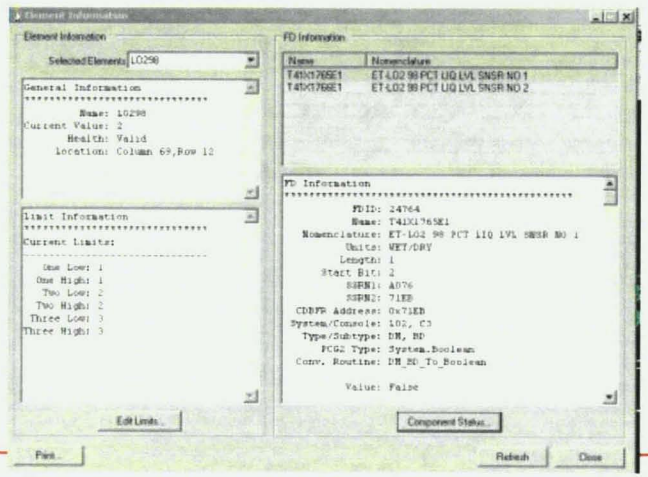
Edit Limits



Component Status



Element Information



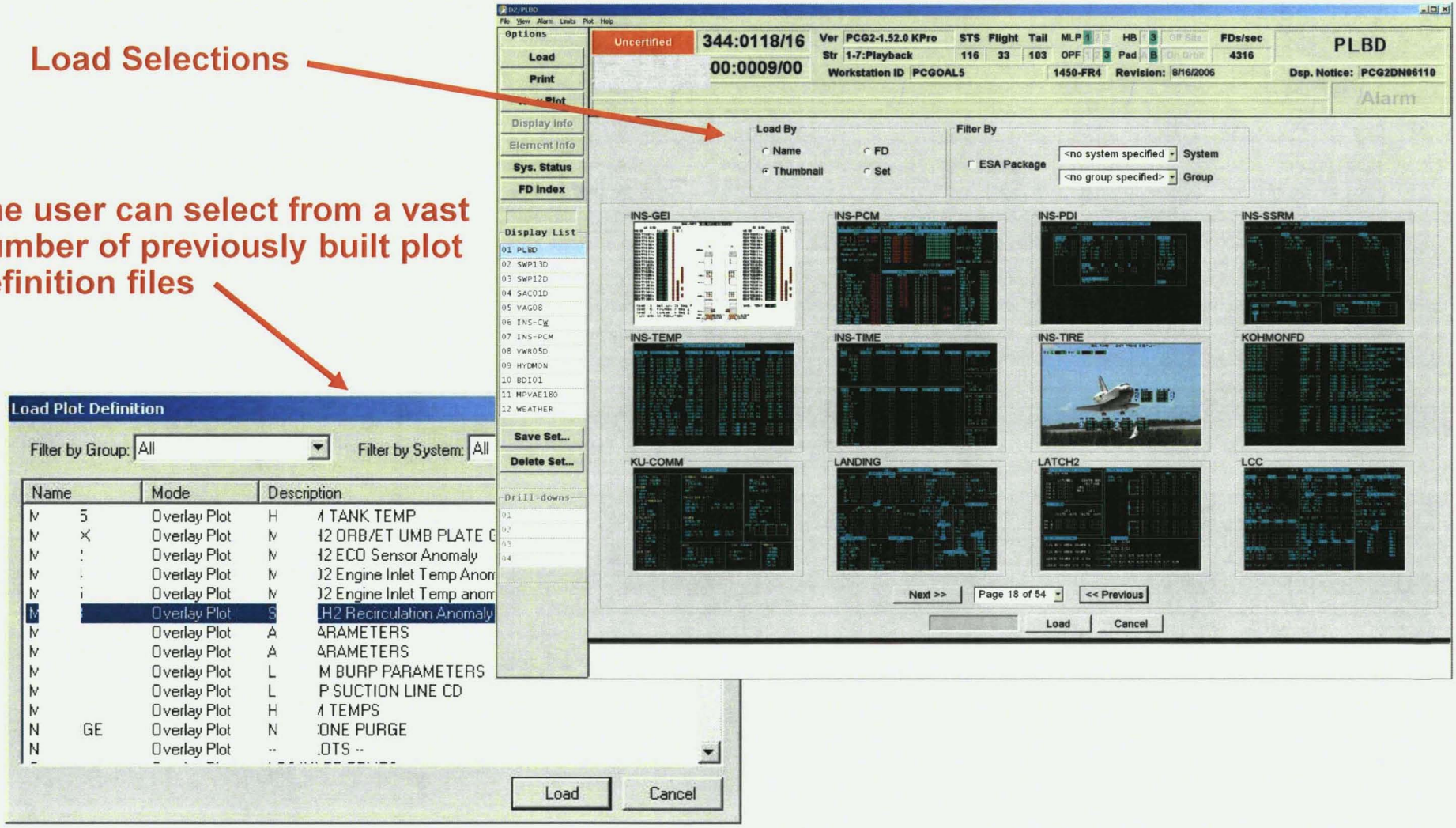
United Space Alliance

Specific Features

Allows user access to predefined parameter sets that are frequently used saving time during operations

Load Selections

The user can select from a vast number of previously built plot definition files



United Space Alliance

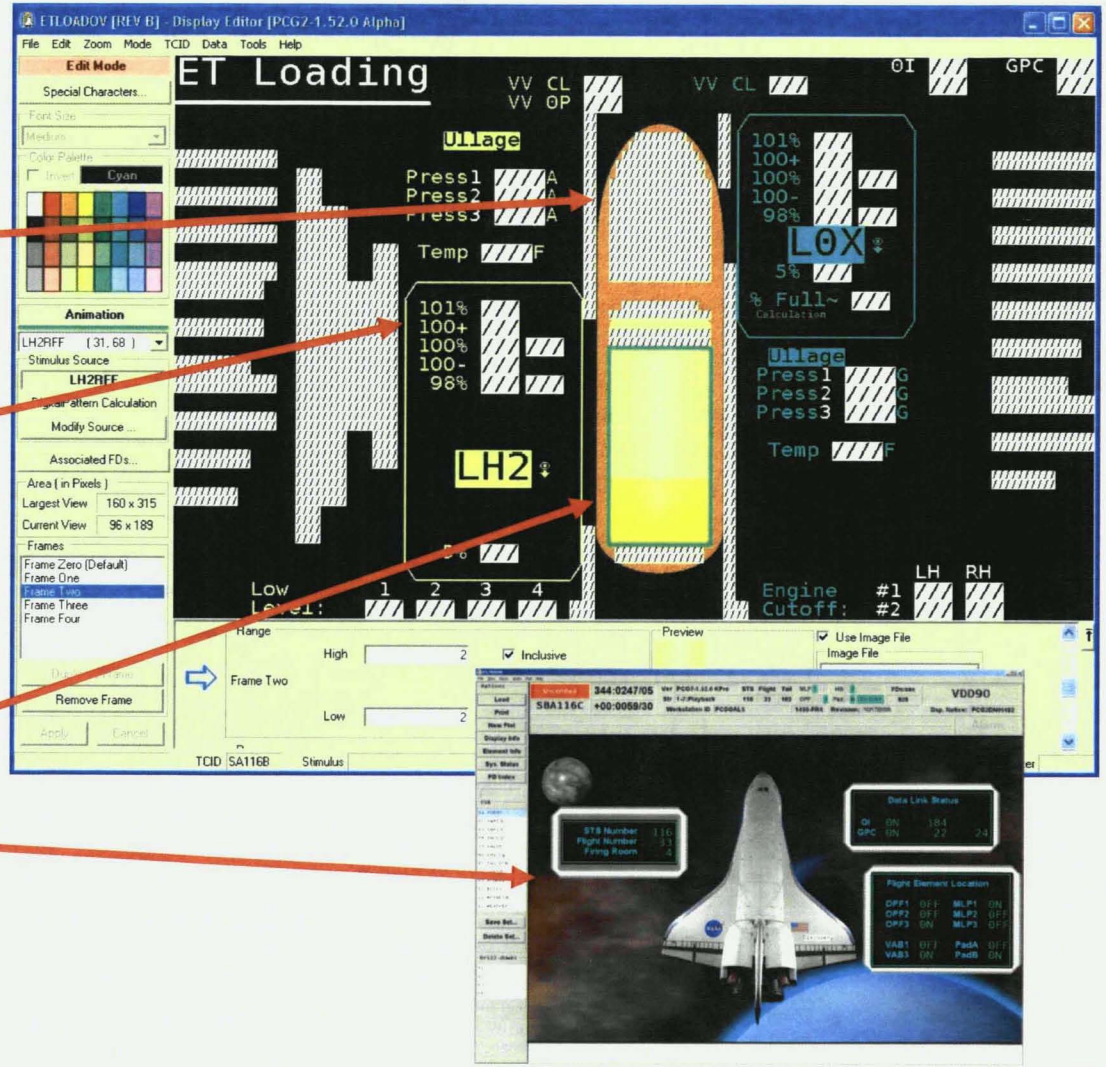
Specific Features

Strong Editor Tool allows efficient display development with capabilities to add embedded calculations, images, animations, drill downs, and other situational awareness enhancements

Tank animation is driven by embedded calculation

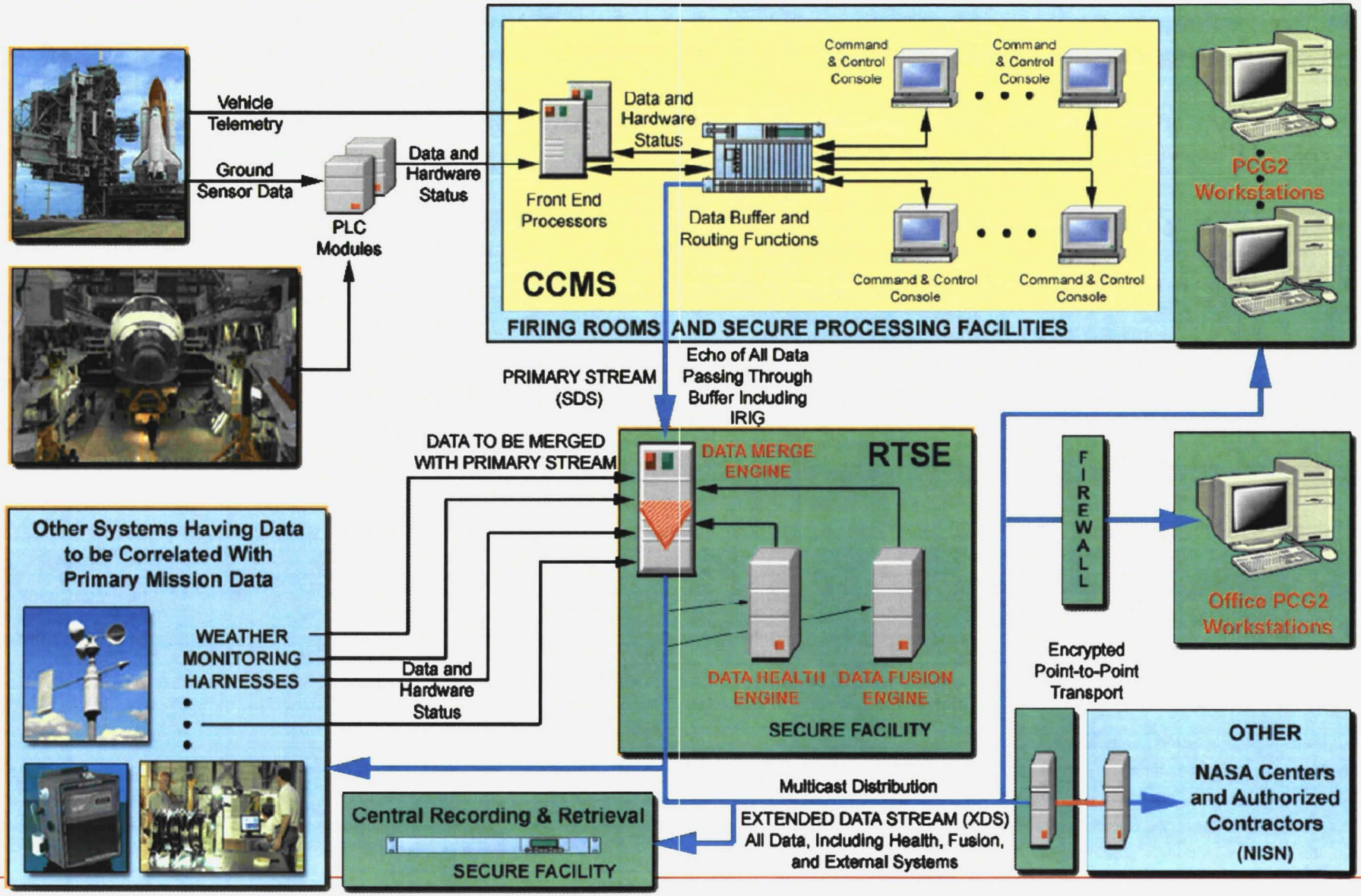
Limits can be adjusted to change color and provide audible alarms

Background Images can be either basic or photo quality



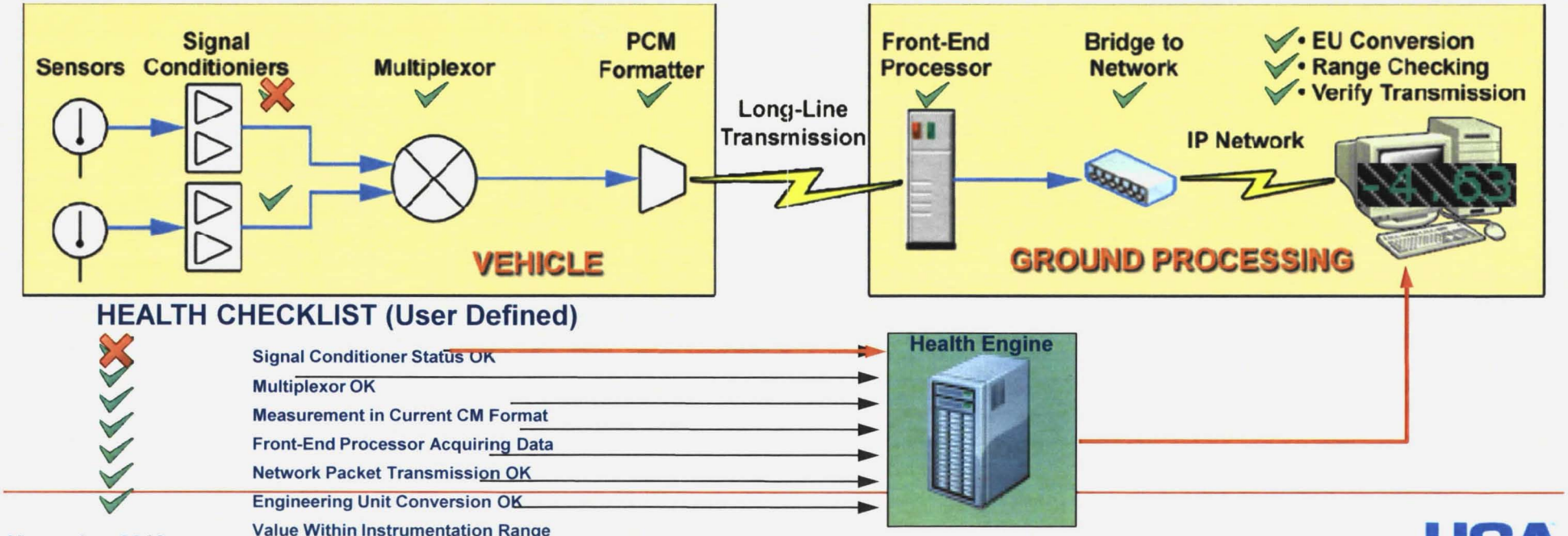
United Space Alliance

PCG2 With RTSE – Overview



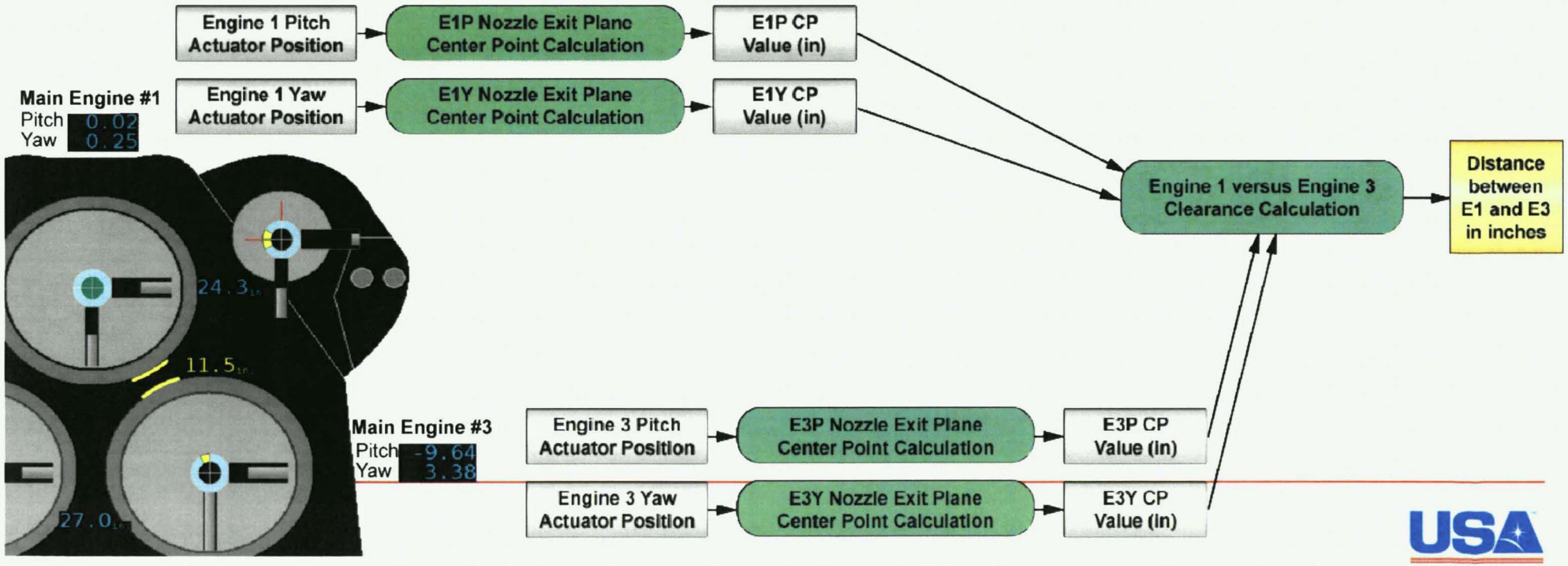
Health Functionality

- Each Health Rule captures the in-depth knowledge of the responsible hardware engineer.
- The Health Engine analyzes Health Rules in real time concurrent with vehicle data propagating through the system.
- The Merge Engine integrates Health data with the vehicle data.
- The Merge Engine transmits Health data to a local data center for further analysis.



Fusion Functionality

- Fusion captures the technical knowledge of the engineer which lends to a virtual model of the vehicle.
- Fusion is a centralized computation engine consuming instrumented vehicle data and calculating new derived data.
- The Merge Engine integrates Fusion data with the vehicle data.
- The Merge Engine transmits Fusion data to a local data center for further analysis.

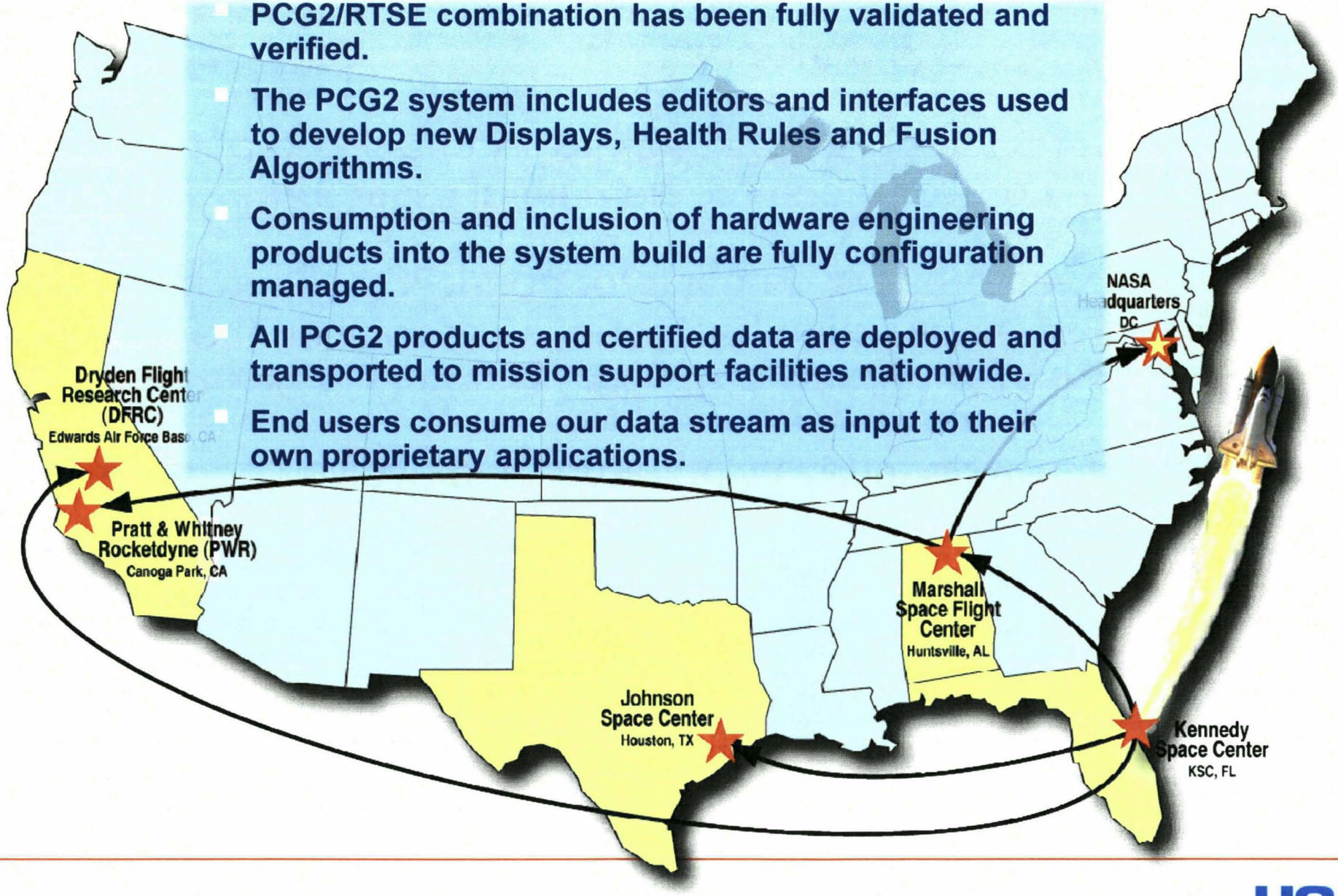


United Space Alliance

Historical Overlay Functionality

United Space Alliance

- PCG2/RTSE combination has been fully validated and verified.
- The PCG2 system includes editors and interfaces used to develop new Displays, Health Rules and Fusion Algorithms.
- Consumption and inclusion of hardware engineering products into the system build are fully configuration managed.
- All PCG2 products and certified data are deployed and transported to mission support facilities nationwide.
- End users consume our data stream as input to their own proprietary applications.



USA
United Space Alliance

Conclusion

- PCG2 supports extensive and regular engineering needs that are both planned and unplanned.
- PCG2 supports the ability to compare, contrast and perform ad hoc data mining over the entire domain of a program's test data.
- There has been growing demand for non-LPS system analysis capability. Experimentation has been successful on the PCG2 merges of external non-LPS data into its data stream today.
- Infrastructure exists today with mature and evolved services.
- Questions and Discussion

Acronyms and Terms:

CCMS – Command Control and Monitoring System

DAP – Data Analysis and Presentation

DMON – Data Monitor

DOS – Disk Operating System

FD – Function Designator (sensors)

FTS – File Transfer Service

GOAL – Ground Operations Aerospace Language

LCC – Launch Commit Criteria

PCG2 – Advisory software written as a Windows .NET application

RTD – Real Time Display

RTP – Real Time Plot

RTSE – Real Time Set Engine

SDC – Shuttle Data Center

TCID – Test Configuration Identifier